



METHOD AND SYSTEM FOR REDIRECTION OF TELECOMMUNICATIONS LINKS

5 CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02869 which was published in the German language on March 8, 2001, and which claims benefit of priority to German Application No. 199 41 151.4, filed in the German language on August 30, 1999, the contents of which are hereby incorporated by
10 reference.

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a method and a system for redirection of telecommunications links, and in particular, allows teleworkers to be included in a
15 corporate network.

BACKGROUND OF THE INVENTION

In addition to the normal basic services such as, setting up telecommunications links and transmitting user data for communication, the providers of public
20 telecommunications networks offer a range of supplementary services.

Such call redirection is, for example, also used by so-called teleworkers or telecommuters. Teleworkers or telecommuters refer to company employees who, in addition to their company work station, also work at home for the company and, in
25 particular, are intended to be accessible by telephone there. Teleworkers and telecommuters such as these include, for example, insurance agents. When such a teleworker activates call redirection, incoming telephone calls to his company work station are automatically redirected to his home connection.

30 For about 15 years, it has been possible, for example with ISDN links and with analogue connections, to be notified of the telephone number of a caller. In the case of ISDN links, in parallel with the user data, which is used for communication, in the B channel, information data is transmitted in the D channel, reflecting a connection identification, and this information data is evaluated and displayed by an appropriately
35 designed telecommunications apparatus. When, during his work the teleworker thus

calls a customer from home, then it is possible for the customer, without any problems, to learn the private number of the teleworker. The customer would then be able to call the teleworker at home even in time periods in which he is not working ,+ and could thus disturb him in his free time. A further problem could also arise, for example, if the teleworker changes his place of work, and is working in the same field for a new company. This change would not be evident to a customer who knew only the teleworker's private number, so that such a customer could possibly likewise change his insurance. However, a change such as this would be undesirable to the companies themselves.

SUMMARY OF THE INVENTION

BRIEF DESCRIPTION OF THE DRAWING

The invention will be explained in more detail in the following text with reference to the attached drawing, in which:

Figure 1 shows a scheme for the telecommunications connections and switching centers involved in the method according to the invention.

Figure 2 shows the redirection of telecommunications links which have been set up to the company work station, to the home work station.

Figure 3 shows the setting up of telecommunications links from the home work station.

Figure 4 shows the response of the home connection for private and business telephone calls.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to the call redirection service, which allows a user to redirect incoming links, in various conditions, to other conditions, for example to automatic announcements, to an operator or to a variable connection at which the user can temporarily be reached. The present invention discloses, in one embodiment, a method for redirection of telecommunications links, which offers a high level of flexibility and in which the redirection of the telecommunications links is not evident to anyone externally.

This method is characterized in that, when setting up a telecommunications link from the second telecommunications connection (that is to say, for example, from the teleworker's home connection) to a third telecommunications connection, (for example a customer's telecommunications connection) the information data containing the connection identification data is modified such that it reflects the connection identification of the first telecommunications connection (in the present example, the connection identification of the company work station) instead of the connection identification of the second telecommunications connection. Accordingly, with the method according to the invention, a business caller in principle is informed of the company number, not simply the private number. From the point of view of the customer, it is transparent. Hence, it appears he is thus in principle calling his insurance agent at his company work station, and/or is being called by his insurance agent from his company work station. This makes it possible, in accordance with for example, German labour laws, to ensure that the teleworker cannot be disturbed during his free time, since business calls are redirected to him at home when he has registered for call redirection.

If the company connection of the teleworker is a main connection, then the telecommunications links are normally redirected in the public switching centers themselves. For this purpose, for example, the public switching center for the first telecommunications connection includes storage of the connection identification of the first telecommunications connection, of the second telecommunications connection to which, when necessary, the link is redirected, and of status information which indicates whether redirection should be carried out. A link which has been set up to the first telecommunications connection is then redirected in the public switching center itself.

In a similar way, information which states what the response of the home connection of the teleworker should be is also stored in the public switching center for the second telecommunications connection. This information includes, for example, the connection identifications of the first and second telecommunications connections. When telecommunications links are set up from home connection, then, when necessary, the information data is automatically modified accordingly in this second public switching center. Since the telecommunications links are set up in the public switching centers under computer control, the redirection and modification of the

information data according to the invention can easily be carried out by an addition to the control software.

5 If the teleworker works for a relatively large company, then the connections to the company work stations are normally combined in a private branch exchange (PBX). Modern private branch exchanges already allow the call redirection service. However, redirection is carried out for telecommunications links which arrive in the private branch exchange and are then, when necessary, passed back from the private branch exchange via the public switching center to the home connection. The lines between
10 the private branch exchange and the public switching center are thus loaded twice by a redirected link. Furthermore, it is virtually impossible to make outgoing calls from the home work station as if, from the point of view of the person being called, they have been made from the company work station.

15 In order to integrate connections within a private branch exchange into the concept of call redirection according to the invention, and to avoid unnecessarily using resource lines between the private branch exchange and the public switching center, it is possible to store information in the private branch exchange controller and in the public switching center as to whether call redirection is activated for a specific private
20 branch exchange connection. Telecommunications links which have been set up from an external telecommunications connection to this private branch exchange connection are, just like the main connections, redirected to the home connection in the public switching center itself. Furthermore, telephone calls from a fourth telecommunications connection, which is likewise a connection within the private
25 branch exchange, are easily passed to the public switching center when call redirection is activated, and redirected from there to the home connection on the basis of the stored information.

A situation can also occur in which the teleworker wishes to call a private branch
30 exchange connection from his home connection. In this case, it is possible for the control software in the public switching center for the home connection to identify an internal telephone number within a private branch exchange, and to set up a link to that private branch exchange automatically. This means that it is not evident even to a telecommunications connection within the private branch exchange whether the
35 teleworker is at his company work station or at his home work station.

In accordance with one advantageous embodiment, call redirection can be activated in a simple manner from the home work station, for example, by setting up a telecommunications link to one of the two public switching centers that are involved, and by transmitting a suitable control signal, for example by entering a specific code and/or a PIN number. The information that call redirection is activated is then at the same time also transmitted to the other public switching center. If the company work station is part of a private branch exchange, then it is possible to provide for an appropriate control signal to be transmitted to the private branch exchange as well. If the private branch exchange is unable to receive such a control signal, then the desired redirection can be reported to the private branch exchange actually on leaving the company work station, with the final call redirection then being activated from the teleworker's home. In the intervening time, it is possible to provide for all links set up to that company connection to be passed to a mailbox.

Even after activation of call redirection, it is often desirable to have the capability to make private calls from the home connection. It is thus possible to provide for the modification of the information data to be suppressed for this one call by dialing a specific code, which is identified by the public switching center for the home work station. It is thus very easy to distinguish in the public switching center for the home connection whether a call that is currently being made is a business call or a private call, so that separate accounts can be produced.

In the simplest embodiment, the information relating to the telecommunications connections between which redirection is intended to be set up is stored within a table in the public switching centers, with a second telecommunications connection to which a telecommunications link is intended to be redirected being permanently preset for a respective first telecommunications connection. Further claims relate to more flexible extensions of the method according to the invention. For example, it may be desirable to have the capability to register for call redirection from any desired external connection, and for the second connection to which telecommunications links should be redirected to be stated on registration. This makes it possible, for example, for telephone calls to be redirected from a company work station to any desired connection at which someone is temporarily accessible (for example to a hotel connection while travelling on business). Furthermore, it is possible to redirect the links to a mobile telephone.

On another embodiment of the invention, a system is proposed by means of which such a redirection method can be carried out. A major component of the system is a switching center which is linked to the company connection and has storage for the connection identification of the company connection, the connection identification of the home connection, and status information which states whether the redirection should be carried out. Furthermore, the switching center includes means for redirection of telecommunications links. In the same way, the home connection is linked to a further switching center, which likewise has storage for information defining the response of the home connection. Furthermore, this switching center however, also includes means for modification of the information data, in order, according to the invention, to reflect another connection identification.

The method according to the invention is preferably implemented by a Central Office Exchange Service (herein after "Centrex"). This means a service packet in the public network, which provides means to set up a corporate network with extension functions. A Centrex makes it possible to combine the first telecommunications connection A1 at the company work station with the second telecommunications connection A2, e.g. the home connection, logically in the network-wide so-called Centrex group. In the example illustrated in Figure 1, the first telecommunications connection A1 is part of a private branch exchange PBX, which has at least one further exchange connection A4. This private branch exchange PBX is linked to the telecommunications network N via the public switching center VST1 for the private branch exchange PBX. This public switching center VST1 has a memory apparatus, referred to in the following text as a teleworker list L1, which allows rapid access to the data for that teleworker, and the numbers of his company connection A1 and his home connection A2. Furthermore, status information is stored for each pair of connections A1, A2 stored in the teleworker list L1, stating whether redirection should or should not be carried out. Similar information is also stored in a second teleworker list L2, which is part of the public switching center VST2 for the home connection A2. This defines the intended reaction of the home connection A2 when setting up telecommunications links.

Call redirection is activated by the teleworker from his home connection A2 by entering a predetermined access code, followed by a personal PIN number, to identify him. This is identified by the switching center VST2 for the home connection A2, the registration status is modified as appropriate, and information is also passed to the

switching center VST1 for the company connection A1. Call redirection can be deactivated once again, as well, in the same way. It is then, for example, possible to record the times of registration and deregistration, and thus the teleworker's working hours, as well.

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The complete registration process is preferably carried out directly from the teleworker's home connection A2. However, it might also be necessary for the teleworker to report a call redirection to the private branch exchange PBX from his company connection A1 when leaving the company work station, with call redirection not finally being activated until he is at home. However, since the teleworker is
 10 unable to receive calls in the intervening time period, it is possible for links which have been set up to the company connection A1 to be passed during this time period to a mailbox M which is part of the public switching center VST1 for the company connection A1, with this mailbox M then receiving messages, or emitting an
 15 appropriate announcement.

Figure 2 shows the redirection process according to the invention for telecommunications links which have been set up to the company work station A1 of the teleworker. If, for example, a customer dials on his external connection A3 the
 20 number of the company work station A1 of the teleworker, then a link is first set up to the public switching center VST1 for the company work station A1. However, on the basis of the information stored in the teleworker list L1, the public switching center VST1 identifies the fact that the call should be redirected to the telecommunications connection A2. The telecommunications link is then redirected directly from there, so
 25 that the lines between the public switching center VST1 and the company private branch exchange PBX are not loaded. Furthermore, this redirection is not evident to the telecommunications connection A3, so that, from his point of view, the customer is calling the teleworker at his company work station A1.

30 If the company work station A1 is called from a connection A4, which is likewise integrated in the private branch exchange PBX, then it is normally sufficient in private branch exchanges to dial ~~only~~ the shortened direct dialing number of the extension connection. Thus at this point in order to make it possible to carry out redirection to the home connection A2 in this case as well, at least information as to whether a link
 35 which has been set up to the connection A1 should be redirected is thus stored in the private branch exchange PBX. When registering for call redirection, the

corresponding information can be sent from the switching center VST1 by means of QSIG (Q-(Reference Point) Signaling). When redirection is desired, the link is simply passed to the public switching center VST1 for the private branch exchange PBX. The public switching center VST1 then once again identifies a telecommunications link set up for the connection A1, and this link is then redirected to the home connection A2, on the basis of the information stored in the teleworker list L1. The redirection process is not evident to the caller in this case either. As before, of course, it is still possible to reach the teleworker at his home work station A2 using his normal private number.

When telecommunications links are redirected, it is possible to arrange for the caller to be charged for setting up the link to the public switching center VST1, but for the cost of the remaining connecting path to be at the expense of the teleworker (or his company).

Figure 3 shows how telecommunications links originating from the home connection A2 of the teleworker are set up. When this teleworker dials the number of the connection A3 (for example a customer), then the telecommunications link is set up via the public switching center VST2 for the home connection A2 and the telecommunications network N to the external connection A3, in the known manner. However, in addition, the information which is stored in the teleworker list L2 in the public switching center VST2 is now used to modify the information data transmitted in parallel. If the customer at the connection A3 is able to identify the caller on the basis of the information data, the number of the company connection A1 now appears in his display, rather than the number of the home connection A2. From the point of view of the connection A3, the telecommunications link has thus originated from the company connection A1. This prevents the customer from learning the private number of the teleworker, and possibly being able to call him during his free time.

If, on the other hand, the teleworker wants to call a colleague at his company work station A4 from his home connection A2, then it is sufficient for him just to dial the extension-internal direct-dialing number even on his home connection A2. This is identified by the public switching center VST2, and the telecommunications link is automatically passed via the public switching center VST1 to the private branch exchange PBX and from there to the extension connection A4. The sequence for call redirection is essentially the same if the teleworker's company connection is not an

extension connection but an individual connection, for example the connection A5 shown in the drawing. One difference is that the intermediate step of passing on links via the private branch exchange PBX is omitted, although the telephone number display is modified as before.

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If it is also possible to provide for the teleworker to make and receive private calls from his home connection A2, even after registering for call redirection. In this case, he dials a specific control code, in order temporarily to suppress the modification of the information data, and he then dials the desired telephone number. The private number
10 of the connection A2 rather than the company number of the connection A1, then appears at the connection being called.

Figure 4 shows the response of the home connection A2 and of the public switching center VST2, once again schematically. When call redirection is not activated (top)
15 the connection A2 behaves like a normal private telephone connection, with the private subscriber profile TP1. This subscriber profile TP1 states, for example, the telephone number of which the connection A2 can be accessed, and whether this connection A2 has any associated additional services (call waiting, mailbox etc.). In addition, the data which is required for call redirection and which defines the teleworker profile TP2 is already stored in the teleworker list L2, although initially it
20 has no influence on the behavior of the connection A2.

When the teleworker registers for call redirection, then the connection A2 is also associated with the teleworker profile TP2. The actual response of the connection A2
25 then depends on the incoming and outgoing telecommunications links. When a link is set up to the connection A2 which was initially set up to the company connection A1 but was then redirected, or if, after registering for call redirection, the teleworker dials a number, the connection A2 responds on the basis of the teleworker profile TP2 in the same way as the company connection A1. In the case of incoming links which have
30 been set up by dialing the private number or by entering the previously mentioned control code, the connection A2 responds like the normal private connection, however, in accordance with the normal subscriber profile TP1.

It would now also be feasible for the person using the extension connection A1 to be a
35 teleworker as well, who is likewise registered for the call redirection method. In this case, a telecommunications link is then passed from the home connection A2 of the

calling teleworker to the public switching center VST1 for the private branch exchange PBX. The private branch exchange PBX recognizes that the telecommunications link which has been set up to the extension connection A4 should be redirected, and the telecommunications link is automatically redirected to the home connection of the second teleworker. The data for this second teleworker is then also stored in the teleworker lists for the switching center VST1 and in the public switching center for the home connection of the second teleworker.

On the basis of a first embodiment, the company connection A1 of the teleworker is permanently associated with his home connection A2 in the teleworker list L1, thus allowing very rapid access to the data and counteracting possible misuse of the call redirection process. However, for flexibility reasons, it is possible for the second connection, which is associated with the company connection A1 and to which a telecommunication link should be redirected, to be defined on registration. This may be done, for example, by the teleworker dialing a specific control code for activation of call redirection, followed by the number of the desired second connection (although it would also be possible for this to be identified automatically) as well as a personal PIN number to identify him, from that connection to which the links should be redirected. Then, for example, the teleworker list L1 would initially include information as to which personnel are authorized to make use of the redirection service. The information can then be added to just on registration. In this case, the teleworker profile TP2 shown in Figure 4 would be produced, and loaded in the public switching center VST2 for the second connection A2, only on registration for call redirection. It is thus possible to be included in the system from any desired public connection. Furthermore, it would then also be possible to redirect the calls to a mobile radio telephone (for example a GSM telephone).

Since the method according to the invention can be implemented by addition to the switching center technology, this means that it is independent of the locations of the connections. However, any location change just requires that a new entry be added to the teleworker list. That is, it involves only a small amount of administration effort.